the individual cases. However, these are trivial matters compared with the greatness of the labor and the value of the work. The author died suddenly in the full vigor of opening manhood and in the midst of his great work, one of his last requests being that his work be published in one of the world's great languages. To this sad fact must be attributed the shortcomings in the text.

No such criticism can attach to the plates, most of which bear the legend, "C. Hammarberg del." These certainly constitute one of the great contributions to neurological science. So conscientiously has this work been done that the observer seems to be looking at the very cells of the brains of the normal men and idiots and imbeciles. In one class he sees the rich development of the cortical elements and compares this with the stunted growth in the defectives. Nothing could be clearer and more convincing than this comparison, and nothing could more forcibly present the all important question: What are the causes of the differences observed and what the essential conditions which have favored growth in the one instance and arrested it in the other?

C. F. H.

Contributions to the Structure and Development of the Vertebrate Head. WM. A. LOCY. Journal of Morphology, XI, 497-594, Plates XXVI-XXX, 11 cuts in text, 124 Figs. Boston, 1896.

Since Oken and Goethe first outlined the theory that the vertebrate head represented a number of coalesced and modified vertebræ with their contents and appendages, the subject has attracted attention as one likely to throw some light on the ancestry of the vertebrate phylum. Owen's work was directed largely toward the skull, with the idea that the bones furnished the most trustworthy outlines of segmentation; now these are considered as "external features, of no segmental importance whatsoever." Huxley, with his usual keen insight, turned the discussion toward organs of real segmental importance, the cranial nerves and gill clefts. And again with Balfour's classical work, attention turned toward the mesoblastic somites, of which he clearly identified eight in the region of the head. On the strength of Balfour's work chiefly, the tendency has prevailed among embryologists to consider the mesoblastic segments the primary divisions to which the nervous axis has come secondarily to conform. This is the view quite generally expressed in the various vertebrate embryologies. Thus the nervous system is moulded by its environment mechanically, as it were, and at the outset must therefore waive its claim to being the "master organ" of the body. It is thus seen to be of considerable psychological and physiological importance that Locy brings out the fact that the first traces of segmentation appear in the neural plate and not in the mesoblast, and thus the nervous system assumes its position from the first.

In three former papers (reviewed in this JOURNAL, VI, 448), Locy states the main fact, viz., that he finds eleven neural segments clearly outlined in the expanded portion of the neural plate in one of the sharks, in *Amblystoma Diemyctylus* and in *Torpedo ocellata*. The present paper marshals all the facts which the author has been able to gather, and presents them in the clearest possible form, and lavishly illustrated. The chick and frog are also found to have the same number of head segments, though very obscure in the frog. In the chick they may be observed as soon as the neural folds are formed, and for some time after the mesoblastic somites begin to develop. That they are not artefacts is witnessed by the

fact that they are uniformly found in material after different methods of preservation, and especially by the fact that the segments can be seen in the fresh living embryos.

The entire number of segments in the brain region is given as fourteen, with a possible fifteenth represented in the median unpaired tip at the extreme front. Between these primitive segments and the cranial nerves the relations are not definitely ascertainable at present. A "tentative estimate of numerical relations" is as follows: I. First neuromere of fore-brain, olfactory. II. Second neuromere of fore-brain, optic. III. Third neuromere of fore-brain, possibly nerve to pineal sense-organ. IV. First neuromere of mid-brain, oculomotor. V. Second neuromere of mid-brain, trochlearis. VI. First neuromere of hind-brain, anterior root of trigeminus. VII. Second neuromere of hind-brain, main root of trigeminus. VIII. Third neuromere of hind-brain, no nerve root, in early stages. IX. Facialis. X. Auditory. XI. Glossopharyngeal. XII, XIII, XIV. Roots of vagus.

A summary of nine headings closes the first part of the paper. Abbreviated these are as follows: 1. The neuromeres are not artefacts. 2. "Neuromeric segmentation" appears "long before there are any segmental divisions of the mesoderm," and is therefore "more primitive than mesodermic segmentation." 3. The structure of the segments proves them to be characteristic cell groups and not mere "mechanical undulations." 4. The entire embryo is similarly segmented, passing thus through an arthrometric condition similar to that of arthropods and worms. 5. Eleven segments are clearly defined in front of the vagus region, or fourteen in all (nine in the hind-brain, two in the mid-brain and three in the fore-brain). 6. There is evidence to show that the spinal cord is being encroached upon by the brain, seven segments appearing first in the hind-brain, two more differentiating later. 7. The segmentation is clearest in the epiblast and least clear in the mesoblast. 8. The segments are related to cranial and spinal nerves and sense organs. 9. The neuromeres are greatly modified and early obliterated in front, persist until after the development of the cranial nerves in the hind-brain region, and then they fade away.

The second part of the paper is devoted to a discussion of the sense organs, by which the author's former position is strengthened. It is especially useful as a presentation of the evidence which indicates that the sense organs of the head region arise in a serially homologous manner, from the nasal pits and optic vesicles to the auditory and lateral line organs.

C. F. H.

Notes of a Case of Dual Brain Action. LEWIS C. BRUCE. Brain, LXIX, 1895, pp. 54-65.

The peculiar interest attaching to this case relates to the definite evidence presented to prove that the right and left cerebral hemispheres controlled the individual in different and characteristic ways. The subject is a Welsh sailor, insane fifteen years, noted for exhibiting two distinct states. These the author distinguishes briefly as the "English" and "Welsh" state. In the Welsh state he was "absolutely demented," and did not understand a word that was said to him, but frequently jabbered incoherent Welsh. From this state he passed quite suddenly into the English state, in which "he was restless, talkative, destructive and mischievous," and expresses himself in English, and understands what is said to him. In the Welsh state he "used the left hand exclusively" and